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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/691,903

10/23/2003

Chan-Soo Hwang

678-1217 (P10800)

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26646

7590

12/29/2006

KENYON & KENYON LLP
ONE BROADWAY
NEW YORK, NY 10004

EXAMINER

WILLIAMS, LAWRENCE B

ART UNIT

PAPER NUMBER

2611

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
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3 MONTHS

12/29/2006

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/691,903

Applicant(s)

HWANG ET AL.

Examiner

Lawrence B. Williams

Art Unit

2611

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 October 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7, 9, 11-13, 16 and 19 is/are rejected.
- 7) ☒ Claim(s) 8, 10, 14, 15, 17 and 18 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities:

a.) Equation 4 on page 8 is illegible.

b.) Equations 9 and 10 on page 10 are illegible.

c.) s^2 should be replaced with s_2 in row 1 of equation 11 of page 11.

d.) The term $e^{j\theta_4}$ in line 18 of page 12 should be replaced with $-e^{j\theta_4}$ as in equation 11 of page 11.

e.) The examiner suggests applicant replace lines 22-24 of page 14; "According to the first embodiment of the invention, a preferable phase rotation range is between 21° and 69° for QPSK, between 21° and 24° for 8PSK, and is 11.25° for 16PSK, centering on 45° " with "According to the first embodiment of the invention, a preferable phase rotation range is between 21° and 69° , centering on 45° for QPSK, between 21° and 24° for 8PSK, and is 11.25° for 16PSK." for clarification purposes. The examiner makes this suggestion in view of the limitation presented in claim 4.

f.) Equation 15 on page 16 is illegible.

g.) The word "receiver" in line 1 of page 17 should be replaced with "transmitter".

Appropriate correction is required.

2. The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Objections

3. Claim 18 is objected to because of the following informalities: The equation present is unclear. Some variables, upper and lower subscripts are illegible.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 3-6 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claim 3 cites the limitation “wherein the number of the selected symbols is 2, and the selected symbols are related to different metrics during decoding at the receiver”. Applicant’s mentions rotating a symbol pair related to different matrixes (pg. 11, lines 4-10) but fails to disclose how the selected symbols related to different metric values are achieved in the invention. Applicant only cites that “it is possible” in line 5.

Claims 4-6 stand rejected based on their dependency upon rejected claim 3.

Claim Rejections - 35 USC § 103

Art Unit: 2611

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1-2, 7, 9, 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Uysal et al. (New Space-Time Block Codes for High Throughput Efficiency) in view of Boariu et al. (US Patent 6,865,237 B1).

8.

(1) With regard to claim 1, Uysal et al. discloses a transmitter for transmitting complex symbols in a wireless communication system, comprising: three transmission antennas (pg. 1105, D. Search Results, line 1); and an encoder for grouping N input symbols into N combinations each including three symbols so that the N input symbols are transmitted only once from each antenna and at each time interval, and delivering the N combinations to the three transmission antennas for N time intervals (pg. 1106, col. 1, lines 1- matrix structure (9)). Though Uysal et al. does not explicitly disclose a transmitter and encoder and delivering, such elements and the delivering would be inherent to one of ordinary skill in the art in a wireless communications scenario as taught by Uysal et al. (pg. 1106, III, Simulation Results).

However, Uysal et al. doesn't each wherein at least two symbols selected from the N input symbols are phase-rotated by predetermined phase values.

However, Boariu et al. teaches in a similar endeavor wherein at least two symbols selected from the N input symbols are phase-rotated by predetermined phase values (col. 41, lines 32-38). Boariu et al. discloses deterministic phase rotations applied to all the elements of a

Art Unit: 2611

given column which would yield at least two symbols selected from the N input symbols are phase-rotated by predetermined phase values.

Therefore it would have been obvious to one skilled in the art at the time of invention to incorporate the teachings of Boariu et al. to combat degradation due to fading (col. 41, lines 37-38).

(2) With regard to claim 2, Uysal et al. also discloses wherein $N=4$ (pg. 1106, lines 1-matrix structure (9)). Uysal et al. teaches $N=4$ symbols, s_1-s_4 and the transmission of three of the symbols in $N=4$ time intervals.

(3) With regard to claim 7, Uysal et al. also discloses wherein the encoder produces four combinations by applying negative and conjugate to four symbols so that two symbol sequences among three symbol sequences delivered to each antenna for four time intervals are orthogonal with each (pg. 1105, C. Search Procedure, lines 9-11; pg. 1106, matrix structure (9)). As shown by the matrix structure, Uysal et al. applies negative and conjugate to the four symbols so that two symbols sequences are orthogonal.

(4) With regard to claim 9, Uysal et al. also discloses where $N=3$ (pg. 1106, matrix structure (10)). Uysal et al. discloses a matrix structure for full rate $= 1 = 3/3$, 3 symbols in 3 time intervals for a three antenna case.

(5) With regard to claim 11, Boariu et al. discloses that deterministic phase rotations may be applied to the elements of a given column. Applicant's claimed multiple of 30 degree would be a design choice and deterministic as cited by Boariu et al. dependent upon the system environment. It would also be obvious to one skilled in the art that the phase values would be

Art Unit: 2611

chosen to maximize a distance between them to combat interference between the symbols (col. 41, lines 32-38).

(6) With regard to claim 19, Uysal et al. discloses a transmitter for transmitting complex symbols in a wireless communication system, comprising: three (M) transmission antennas (pg. 1105, D. Search Results, line 1); and an encoder for grouping $N=4$ input symbols into $N=4$ combinations each including three (M) symbols so that the $N=4$ input symbols are transmitted only once from each antenna and at each time interval, and delivering the $N=4$ combinations to the three (M) transmission antennas for $N=4$ time intervals (pg. 1106, col. 1, lines 1- matrix structure (9)). Though Uysal et al. does not explicitly disclose a transmitter and encoder and delivering, such elements and the delivering would be inherent to one of ordinary skill in the art in a wireless communications scenario as taught by Uysal et al. (pg. 1106, III, Simulation Results).

Uysal et al. doesn't teach wherein at least two symbols selected from the N input symbols are phase-rotated by predetermined phase values.

However, Boariu et al. teaches in a similar endeavor wherein at least two symbols selected from the N input symbols are phase-rotated by predetermined phase values (col. 41, lines 32-38). Boariu et al. discloses deterministic phase rotations applied to all the elements of a given column which would yield at least two symbols selected from the N input symbols are phase-rotated by predetermined phase values.

Therefore it would have been obvious to one skilled in the art at the time of invention to incorporate the teachings of Boariu et al. to combat degradation due to fading (col. 41, lines 37-38).

9. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Admitted Prior Art (Fig. 2) in view of Uysal (New Space-Time Block Codes for High Throughput Efficiency).

Applicant's Admitted Prior Art (Fig. 2) discloses a receiver for receiving complex symbols in a wireless communication system, comprising: a symbol arranger (160) for receiving signals received via at least one reception antenna (elements 14...142) from three transmission antennas (Fig. 1, elements 130, 132, 134); a channel estimator (150) for estimating three channel gains representing channel gains from the three transmission antennas to the reception antenna; and a decoder for calculating metric values for all possible symbol combinations each including three symbols (pg. 3, lines 1-5) by using the channel gains and the signals received by the symbol arranger, and detecting three symbols (pg. 3, lines 11-19).

Applicant's Admitted Prior Art does not teach the receiver receiving for only three time intervals but teaches the receiver for eight time intervals which would inherently include the three time intervals as claimed by applicant. Applicant Admitted Prior Art also does not teach detecting three symbols having a minimum metric value.

However, Uysal et al. proposes space-time block codes for three transmit antennas (abstract). Though Uysal et al. doesn't teach a receiver he does teach the method of applicant's receiver in his wireless communications scenario (pg. 1106, III. Simulation Results). The symbols are transmitted at each time slot ($M=3$) from $M=3$ transmit antennas. The symbol arranger and reception antenna would be inherent to one skilled in the art (as disclosed by Applicant's Admitted Prior Art) for receiving the symbols over the three time intervals. Uysal et al. further discloses wherein path gains are computed for M paths, thus inherently teaching

Art Unit: 2611

applicant's channel estimator. Uysal et al. further teaches a maximum decoder at the receiver for computing all possible symbol combinations (12) and deciding (detecting) in favour of constellation symbols ($M=3$), which minimize the sum (minimum metric value).

It would have been obvious to one skilled in the art at the time of invention to incorporate the teachings of Uysal et al. as method of receiving the proposed new codes for higher efficiency and to achieve a larger throughput rate (abstract).

Double Patenting

10. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

11. Claims 12-13 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1,2 and 10 of copending Application No. 10/692,896. Although the conflicting claims are not identical, they are not patentably distinct

Art Unit: 2611

from each other because claims 1, 2 and 10 of copending Application No. 10/692,896 contain every element of claims 12-13 of the instant application. The three transmission antennas, symbol arranger, channel estimator, first and second decoders and parallel to serial converter of the instant application's claim 12 are all disclosed in claims 1 and 2 of the co-pending application. The symbol generator and phase rotator and detector of claim 13 of the instant application are disclosed in claim 10 of the co-pending application. Though the wording of the functionality of the devices is different, the same function by each device is performed in both sets of claims.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Allowable Subject Matter

12. Claims 8, 10, 14-15, 17 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

13. Claim 18 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims and to overcome the objection cited above.

Conclusion

14. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a.) Whinnett et al. discloses in US Patent 6,317,411 B1 Method and System For Transmitting and Receiving Signals Transmitted From an Antenna Array With Transmit Diversity Techniques.

b.) Hwang et al. discloses in US 2004/0213353 A1 Apparatus and Method For Transmitting/Receiving Differential STBC Using Channel Power.

c.) Hwang et al. discloses in US 2004/0072595 A1 Transmitting And Receiving Apparatus For Supporting Transmit Antenna Diversity Using Space-Time Block Code.

d.) Hottinen et al. discloses in US 2003/0073410 A1 Data Transmission Method and Radio System.

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lawrence B Williams whose telephone number is 571-272-3037. The examiner can normally be reached on Monday-Friday (8:00-6:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ghayour Mohammad can be reached on 571-272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

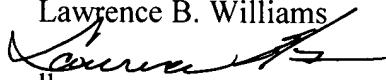
Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Application/Control Number: 10/691,903

Page 11

Art Unit: 2611

Lawrence B. Williams

A handwritten signature in black ink, appearing to read 'Lawrence B. Williams', written over a horizontal line.

lbw

December 24, 2006